# Pesticide Residues in Food

Pesticides are substances or mixtures of substances intended for preventing, destroying, repelling, or mitigating plant or animal pests and may include herbicides, insecticides, fungicides, and rodenticides. More than a billion pounds of pesticides are used in the U.S. each year to control weeds, insects, and other organisms that threaten or undermine human activities (U.S. EPA, 2009). Some of these compounds can be harmful to human health if sufficient quantities are ingested, inhaled, or otherwise contacted (see the Urinary Pesticides indicator). Potential health effects and primary exposure routes vary by chemical. The most common routes of exposure for the general population are ingestion of a treated food source and contact with applications in or near residential sites. Pesticides may also be harmful in the environment when non-target organisms are exposed.

This indicator represents data from the U.S. Department of Agriculture's Pesticide Data Program (PDP), which measures residue levels for hundreds of pesticides and their metabolites in fruits, vegetables, grains, meat, and dairy products from across the country, sampling different combinations of commodities each year. The analysis examines pesticides currently on the market and also includes continued testing for some persistent and bioaccumulative pesticides that have been banned since the 1970s, such as aldrin/dieldrin, heptachlors, and DDT and its metabolites. PDP data collection began in 1991 and includes both domestic and foreign-produced commodities. Results are published in annual reports, which include statistics on the number of pesticide residues detected, the number of residues exceeding the tolerance established by EPA for a given pesticide-commodity pair (Code of Federal Regulations, Title 40, Part 180), and the number of residues detected for which no tolerance has been established. This indicator depicts data from 1994 to 2012; data from before 1994 are considered less reliable. Between 1994 and 2012, the number of food samples analyzed per year ranged from a low of 5,771 (1996) to a high of 13,693 (2005), and has decreased slightly since 2005.

## What the Data Show

The percent of samples with no detectable pesticide residues generally increased during the period from 1994 to 2002 (Exhibit 1). Samples with no detects accounted for 38.5 percent of samples analyzed in 1994 and rose to 57.9 percent of samples in 2002. Data for 2004-2012 show a lower percentage of samples with no detects than 2003 data, going from 53.9 percent of samples in 2003 to 23.1 percent in 2007, then increasing to 47.4 percent in 2012. The largest increase in detects in the 2003-2012 timeframe, almost 34 percent, was in those samples with detection of two or more residues. These trends in number of detections have occurred at the same time that analytical limits of detection for various compounds have been decreasing, allowing the instruments to pick up ever smaller concentrations.

Exhibit 2 illustrates the percentage of samples in which at least one pesticide residue was detected at a concentration exceeding the tolerance established by EPA for a given pesticide-commodity pair. The percentage of samples exceeding EPA tolerance values was 0.05 percent in 1994 and peaked at 0.53 percent in 2012.

## Limitations

- As Exhibit 1 explains, PDP data showing percent of samples with a given number of pesticides detected from 2002 and earlier cannot be compared directly with data gathered after 2002. (Before 2003, each compound detected was counted separately; beginning in 2003, measurement of a parent compound and/or any of its metabolites was counted as a single detect.) Additionally, PDP has refined its analytical methods in order to measure a greater number of pesticides analytes (both parent compounds and metabolites) and lowered its analytical limits of detection. Therefore, some increases in the percentage of detects may instead reflect improvements in PDP's analytical method capabilities.
- PDP does not sample all commodities in each individual survey year, so uncertainty is introduced in evaluating changes in the percentage of detects and percentage of samples exceeding tolerances. That is, differences in the percent of detections for any given pesticide class might not be due to an increase (or decrease) in the predominance of detectable residues. Instead, these differences might simply reflect the changing nature and identity of the commodities selected for inclusion in any given time frame. In addition, PDP may preferentially target and more frequently sample specific commodities that are more likely to have pesticide residue, which may also introduce bias in evaluating trends over time.
- The indicator provides summary information on pesticide residues on food, but does not evaluate exposure from dietary intake or assess risks to human health and the environment.

## Data Sources

Data for this indicator were obtained from a series of annual summary reports published by the PDP (USDA AMS, 1996-2014). These reports are all available from http://www.ams.usda.gov/science/pdp/. The Food and Drug Administration also collects data (not reported here) on pesticide residues in cooked food that may be a source of chemicals in human diets. These data are available at http://www.fda.gov/Food/FoodScienceResearch/TotalDietStudy/default.htm.

### References


USDA AMS (United States Department of Agriculture, Agricultural Marketing Service). 2014. Pesticide Data Program: Annual summary, calendar year 2012. http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=stelprdc5106521 (PDF) (183 pp, 1.4MB)

USDA AMS. 2013. Pesticide Data Program: Annual summary, calendar year 2011. http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=stelprdc5102692 (PDF) (195 pp, 1.5MB).

USDA AMS. 2012. Pesticide Data Program: Annual summary, calendar year 2010. http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=stelprdc5098550 (PDF) (204 pp, 5MB).

USDA AMS. 2011. Pesticide Data Program: Annual summary, calendar year 2009. http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5091055 (PDF) (194 pp, 6.5MB).

USDA AMS. 2009. Pesticide Data Program: Annual summary, calendar year 2008. http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5081750 (PDF) (202 pp, 5.3MB).

USDA AMS. 2008. Pesticide Data Program: Annual summary, calendar year

2007.http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5074338 (PDF) (168 pp, 2.1MB).

USDA AMS. 2007. Pesticide Data Program: Annual summary, calendar year 2006.http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5064786 (PDF) (167 pp, 1.6MB).

USDA AMS. 2006a. Pesticide Data Program: Annual summary, calendar year 2005. http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5049946 (PDF) (174 pp, 1.5MB).

USDA AMS. 2006b. Pesticide Data Program: Annual summary, calendar year 2004. http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=PDP2004Summary (PDF) (147 pp, 1.3MB).

USDA AMS. 2005. Pesticide Data Program: Annual summary, calendar year 2003.http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=PDP2003Summary (PDF) (133 pp, 1.4MB).

USDA AMS. 2004. Pesticide Data Program: Annual summary, calendar year 2002.http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=PDP2002Summary (PDF) (136 pp, 1.9MB).

USDA AMS. 2003. Pesticide Data Program: Annual summary, calendar year 2001.http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=PDP2001Summary (PDF) (139 pp, 858K).

USDA AMS. 2002. Pesticide Data Program: Annual summary, calendar year 2000.http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=PDP2000Summary (PDF) (127 pp, 989K).

USDA AMS. 2001. Pesticide Data Program: Annual summary, calendar year 1999.http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=PDP1999Summary (PDF) (112 pp, 663K).

USDA AMS. 2000. Pesticide Data Program: Annual summary, calendar year 1998.http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=PDP1998Summary (PDF) (108 pp, 862K).

USDA AMS. 1999. Pesticide Data Program: Annual summary, calendar year 1997.http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=PDP1997Summary (PDF) (109 pp, 655K).

USDA AMS. 1998. Pesticide Data Program: Annual summary, calendar year 1996.http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=PDP1996Summary (PDF) (86 pp, 534K).

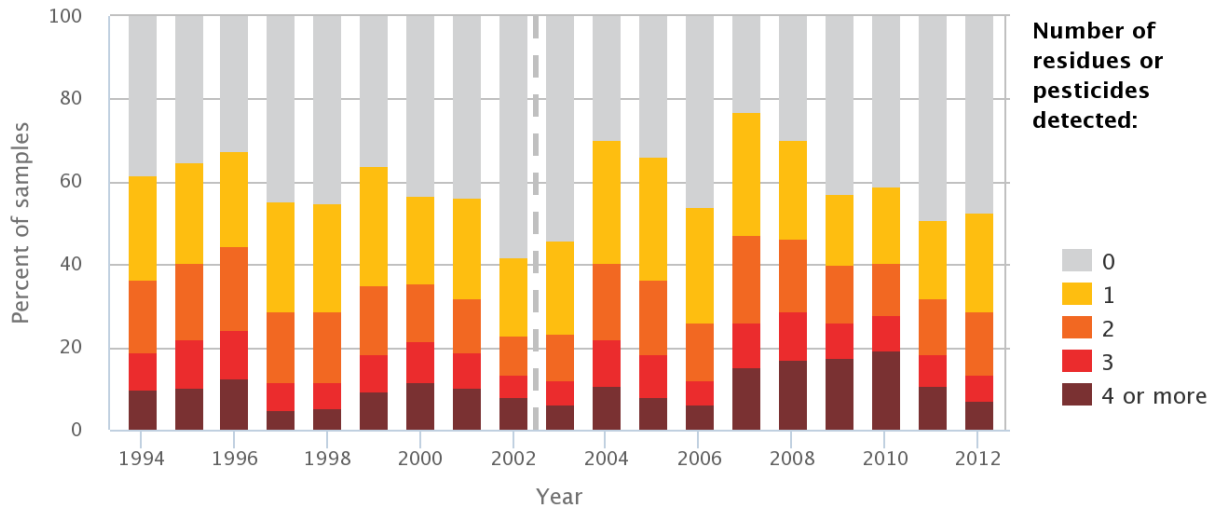
USDA AMS. 1997. Pesticide Data Program: Annual summary, calendar year 1995.http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=PDP1995Summary (PDF) (70 pp, 423K).

USDA AMS. 1996. Pesticide Data Program: Annual summary, calendar year 1994.http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=PDP1994Summary (PDF) (71 pp, 467K).

U.S. EPA (United States Environmental Protection Agency). 2009. 2000-2001 pesticide market

estimates: Usage. Accessed May 6,
2009. http://www.epa.gov/opp00001/pestsales/01pestsales/table_of_contents2001.htm.

**Exhibit 1. Pesticide detections in food in the U.S., 1994–2012**



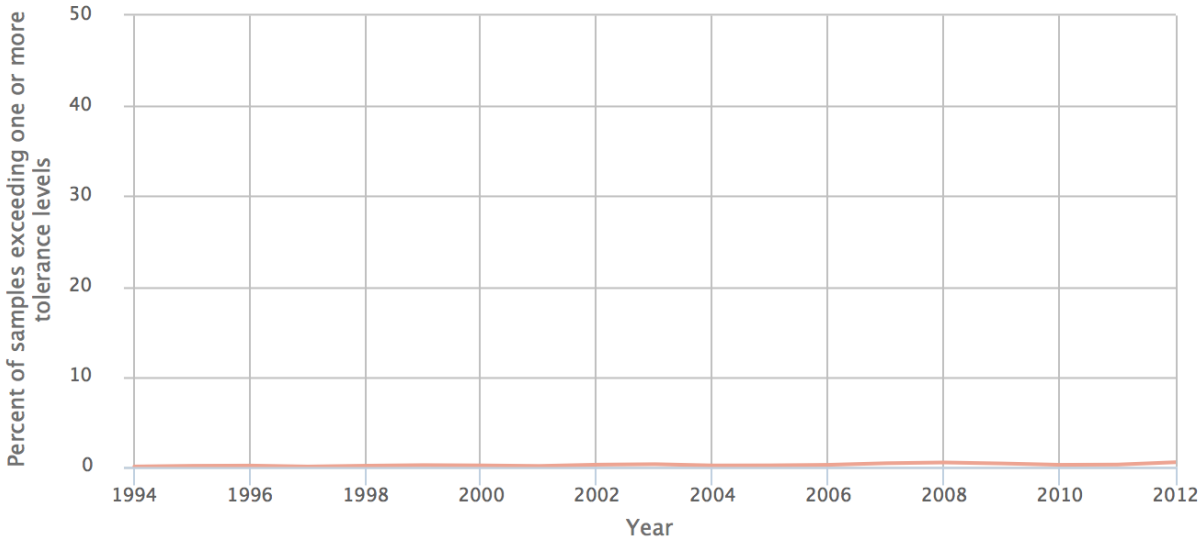

**Coverage:** Based on a survey of fruits, vegetables, grains, meat, and dairy products across the U.S., with different combinations of commodities sampled in different years. Each commodity group is tested for varying numbers of parent pesticides, metabolites, degradates, and/or isomers.

Data from 2003 to 2012 are not comparable to prior years due to a difference in how detects are counted. Beginning in 2003, parent compounds and their metabolites are combined to report the number of "pesticides" rather than the number of "residues," as reported prior to 2003. For example, a sample with positive detections for metabolites of a single pesticide – Endosulfan I, II, and sulfate, for example – would have been counted as three residues detected in the 2002 report. That same sample would be counted as just one pesticide detected in the 2003 report.

Information on the statistical significance of the trends in this exhibit is not presented here. For more information about uncertainty, variability, and statistical analysis, view the technical documentation for this indicator.

**Data source:** USDA Agricultural Marketing Service, 1996–2014

## Exhibit 2. Pesticides exceeding EPA tolerance levels in food in the U.S., 1994–2012




**Coverage:** Based on a random selection of fruits, vegetables, and other food across the U.S., with different combinations of commodities sampled in different years. The number of pesticides and their metabolites for which samples are analyzed varies depending on the commodities tested.

Information on the statistical significance of the trend in this exhibit is not presented here. For more information about uncertainty, variability, and statistical analysis, view the technical documentation for this indicator.

**Data source:** USDA Agricultural Marketing Service, 1996–2014